

Volker Flögel

The Microstructure of European Bond Markets

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Volker Flögel

The Microstructure of European Bond Markets

Organization, Price Formation,
and Cost of Liquidity

With a foreword by Prof. Dr. Lutz Johanning

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Foreword

The volumes outstanding in bond markets are by far larger than in equity markets. Despite this fact, most of the research on the microstructure of financial markets focuses on equity markets. This is even more surprising taking into account that (i) the microstructure of a financial market has a strong influence on its ability to allocate resources efficiently, and (ii) that the results obtained from equity markets cannot be applied to bond markets. The thesis addresses open questions related to the microstructure of bond markets and presents three empirical studies.

In the first paper, a unique dataset of transactions in German federal securities is analyzed to address the question whether the historical grown structure of different coexisting trading segments – exchange trading, bilateral OTC trading, and brokered OTC trading – can be economically justified. There is evidence that the different trading segments are indeed regarded as non-interchangeable by the market participants.

The second part of the thesis focuses on the price formation in customer-dealer and the interdealer bond markets by applying cointegration econometrics to a dataset of high frequency quotes for EMU government bonds. While the customer-dealer market is still very fragmented and intransparent, trading in the interdealer market concentrates on a smaller number of more transparent electronic trading systems like EuroMTS. There is evidence that the share of these two markets in the price formation process depends strongly on the liquidity of a bond. For very liquid bonds the customer-dealer market is dominant, but its information share is much lower for less liquid bonds. This result shows that the prevailing structure in bond markets is especially suited for less liquid bonds.

In the last paper the author concentrates on the cost of liquidity of euro denominated investment grade corporate bonds. This is of particular interest regarding the current efforts of the NASD to make US corporate bond markets more transparent. Surprisingly, the smaller size of the euro bond market and the lack of transparency do not translate into higher cost of liquidity.

Overall, Volker Flögel can generate new results which should be of considerable interest to bond market participants, regulators, and financial researchers.

Professor Dr. Lutz Johanning

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1 Introduction

1.1 Motivation

Financial markets have the important role to aggregate and allocate resources and risks in time and space. In order to do design markets that fulfill this role as efficient as possible, it is important to know how financial markets are organized, how they are regulated, how trades are executed and paid for, and finally, what impact these issues have on the price formation. These questions are extensively treated in a field of research called market microstructure.

While the different facets of the market microstructure theory are well exploited for the stock market,¹ research on bond markets just arose in recent years.² This is surprising considering the importance of bond markets. The ECB (European Central Bank) reported that euro area investment funds have total assets of euro 1,179.4 billion in bond funds but only euro 797.1 billion in equity funds.³ However, research on the microstructure of bond markets is limited due to the decentralized and opaque nature of these markets and, therefore, poor data availability.

Because of the differences between bond and equity markets, theoretical as well as empirical results from equity markets cannot necessarily be transferred. This dissertation is motivated by these differences. Therefore, the most important aspects are reviewed in the next paragraphs.⁴

The first difference is the definition of private information in both markets. In equity markets, private information is defined as superior information on an asset's (future) value. Prices of government securities and, to a large extent, prices of investment grade corporate bonds are strongly dependant on the term structure of the underlying risk-free interest rates,⁵ which in turn, depend on macroeconomic factors that are made publicly available at the same time to all investors through electronic information systems. Therefore, private information on a bond's fundamental value is

¹ For an overview see O'Hara (1995), Madhavan (2000), Biais, Glosten, and Spatt (2004).

² See, e.g., Gravelle (2002) for bond markets and Lyons (2001) for FX (foreign exchange) markets.

³ See European Central Bank (2005), p. 25 of the euro area statistics money, banking and investment funds.

⁴ The categorization follows Gravelle (2002). Although he focuses on government securities markets, most of his arguments also apply to corporate bonds with investment grade rating.

⁵ See Schultz (2001), pp. 682-683.

very unlikely to occur in these markets and, as a result, traditional asymmetric information models like Kyle (1985) are ill-suited to describe the trading process in bond markets. However, it is very likely that dealers in bond markets have private information on the state of the trading environment such as customer order flow. This payoff irrelevant private information is an important determinant of the price discovery process in multiple dealership markets.⁶

Besides the differences in the definition of private information, bonds differ from stocks in other characteristics as well. One distinctive feature is the finite maturity of bonds that leads to a change in the bond's liquidity and yield dynamics during its lifetime. With increasing age of a bond, buy and hold investors absorb a large fraction of the issue in their portfolios and, therefore, reduce the floating supply available for trading.⁷ Another distinctive feature is that the homogeneity among bonds is much larger than among equities. This results in a larger co-movement in terms of yield dynamics and, in turn, implies a greater ease of inventory price hedging in bond markets relative to equity markets. Since two-thirds to three-fourths of the price variation in investment grade corporate bonds can be explained by variations in government securities,⁸ a dealer can even hedge the risk associated with holding an unwanted inventory in these bonds to a large extent by trading government securities or futures on government securities.

Structural differences between bond and equity dealership markets exist regarding the low degree of centralization of bond markets. Overall, three features associated with the bond markets' low degree of centralization cannot be modeled by specialist-based single-dealer theories applied to equity markets such as NYSE (New York Stock Exchange). First, the competition for customer order flow among dealers. Second, the existence of two trading environments: a public environment (the customer-dealer market), where customers trade exclusively with dealers, and an interdealer environment (the interdealer market), where liquidity providers trade among themselves. The third feature refers to the further fragmentation of these two trading environments into several trading segments (exchange, OTC bilateral, and brokered OTC).

⁶ See Lyons (2001), pp. 63-112 and Rappoport (1999), p. 143.

⁷ See Amihud and Mendelson (1991), p. 1413.

⁸ See Schultz (2001), pp. 682-683.

Finally, equity and bond markets also differ in transparency. The transparency of a market is related to its degree of centralization and refers to the amount of information (pre- and post-trade) available to the public. Multiple-dealer equity markets such as NASDAQ (National Association of Securities Dealers Automated Quotations) or LSE (London Stock Exchange) are linked electronically and are thus more centralized than multiple-dealer bond markets. Customers have access to the best bid- and ask-quote and can also trade a predetermined volume at these quotes. Additionally, information on completed trades is published to the public in these markets. In bond markets, quotes are not firm, tradeable volume is rarely posted, and post trade information is usually not published.⁹

The existing differences between multiple-dealer bond and multiple-dealer equity markets are large and point out why an application of the results from equity markets to bond markets is not necessarily possible. Of course, the dissertation cannot cover all distinctive features of the microstructure of bond markets, but the results allow some new and interesting insights into bond markets and multiple-dealer markets in general. The next section gives an overview on the facets of the microstructure of bond markets that are covered in the dissertation and its organization.

1.2 Overview and Organization

The objective of the dissertation is to shed some further light on the microstructure of bond markets. A natural starting point is the organizational structure. As noted above, different trading segments coexist in bond markets: exchange trading, bilateral OTC trading, and brokered OTC trading. Part 2 analyzes for the first time the historically grown organizational structure of the customer-dealer as well as the interdealer market for government bonds and examines whether these structures are economically justified. Based on transaction-cost-theoretical considerations, hypotheses are derived on the relationship between the specificity of a transaction and the market participants' trading segment choice. These hypotheses are empirically tested with a unique dataset

⁹ Exceptions are some electronic customer-dealer trading systems. Information on completed trades is published to the systems' participants, but still no to the broad public. Another exception is the exchange trading, but trading volume in this trading segment is too small to be relevant for institutional investors. The data of institutional trades used in Part 4, e.g., contains only OTC trades and no exchange trades.

comprising more than 180,000 trades in 52 German federal securities provided by the Federal Supervisory Office for Securities Trading (Bundesaufsichtsamt für Wertpapierwesen, BAWe), today Federal Financial Supervisory Authority (Bundesanstalt für Finanzdienstleistungsaufsicht, BaFin). The analysis shows that the existing parallel trading possibilities are actually regarded as non-interchangeable by the market participants. The choice of the trading segment depends on security as well as order characteristics, especially order size. In summary, our analysis shows that the prevailing structure of the secondary market for German federal securities with several differently organized trading segments is economically justified. Each segment of the secondary market for German federal securities satisfies different transaction needs.

Following O'Hara (2003), financial markets provide price formation and liquidity.¹⁰ These are the two microstructure issues addressed in Part 3 and Part 4 of the thesis. Part 3 analyzes the short-run dynamics and relationship between the customer-dealer and the interdealer market. The sample covers euro government bonds issued by members of the EMU (European Monetary Union). During the observation periods, all bonds were traded on EuroMTS, an electronic interdealer system for euro benchmark government bonds. The focus of Part 3 is to reveal each market's contribution to the price discovery process of these bonds. In contradiction to the commonly held belief that the interdealer market slightly leads the customer-dealer market,¹¹ the empirical results provide evidence that the customer-dealer market dominates the price discovery process for euro benchmark government bonds. However, the contribution of the interdealer market to the price discovery depends on bond characteristics. The share in the price discovery process of the interdealer market is larger for less liquid bonds than for liquid bonds.

Part 4 of the dissertation examines the cost of liquidity in the customer-dealer market for euro corporate bonds. There is recent indication that bond trading costs have gone down considerably since the US markets became more transparent with the introduction of TRACE (Trade Reporting and Compliance Engine) by the NASD (National Association of Securities Dealers). Euro bond markets, unlike the US, are still largely opaque and post-trade information is largely absent. In addition, these markets are considerably smaller in size compared to the US, but have been growing rapidly

¹⁰ See O'Hara (2003), p. 1338.

¹¹ See, e.g., Lyons (2001), p. 115.

since the introduction of the euro. Empirical evidence is presented for the first time that this lack of transparency and smaller market size do not, however, translate into greater trading costs, at least for large institutional investors. Unlike other studies that impute trading costs from trade prices alone, we are able to measure these costs directly using quotations from multiple dealers prior to the trade. Moreover, we present results that suggest that trading costs in bond markets are sensitive to market conditions prior to the trade, as in equity markets. We contrast costs of trading similar sizes in equity and bonds of the same issuers and find that bonds cost roughly a little less than 10% of the cost of trading equity.

Finally, Part 5 summarizes the results and gives an overview on possible directions for further research on the microstructure of bond markets.

The thesis is presented as a collection of research papers. As a consequence, the notation may differ per chapter and some definitions as well as aspects of the organizational structure of bond markets may be repetitive. A German version of Part 2 of this dissertation has already been published as Floegel and Kesy (2004) in *Kredit und Kapital*. Part 4 is based on a working paper published as Floegel, Kesy, and Panchapagesan (2005).

2 The Organizational Structure of the Secondary Market for Federal Securities: Historically grown! Economically justified?

2.1 Introduction

The secondary market for federal securities is the economically most important and the most liquid spot market segment of European securities markets. In Germany, the organization of federal securities trading in the secondary market has evolved historically through parallel on- and off-exchange (over the counter, OTC) structures. Generally, three differently structured trading possibilities for federal securities can be identified:

- Exchange trading
- Bilateral OTC trading
- Brokered OTC trading.

The majority of transactions are conducted bilateral OTC. These trades are negotiated directly between institutional counterparties. Nevertheless, exchanges and independent brokers are also able to account for a significant proportion of the turnover in the secondary market for German federal securities. This article examines for the first time whether these economically distinct trading segments fulfill unique investor needs and, therefore, whether their existence is economically justified.

Contrary to equities, price formation in the spot market for federal securities does not result from meeting supply and demand at one central secondary market. The actual valuation procedure takes place on the basis of yield curves, which are provided to market participants through the well known electronic information systems like Bloomberg or Reuters in real time. If however the quality of the price discovery can be excluded to a large extent as a criterion for the market participants' choice of the trading possibility, then the operational efficiency of the trading segment, i.e. in particular the costs of the order execution, is the deciding factor of the trading segment choice.¹²

¹² See Nabben and Rudolph (1994), p. 172.